Flat r semi-flat element including a frame

The present invention relates to a flat or a semi-flat element including a partly or completely circumambient frame and an intermediate wall section.

Products made of plastic material are seen almost everywhere today. One way of manufacturing these products is through injection moulding of a thermoplastic material. It is a well known fact that the material thickness in such injection moulded products may not differ too much within the product since problems with warping will otherwise occur. This warping is caused by the temperature related shrinking, which is relatively great in most thermoplastic materials. An injection moulded product will normally be removed from the mould before it is completely cooled since the cycle time is an important economical factor in plastic manufacturing. The remainder of the cooling will hereby take place outside the mould. The shrinkage is related to the temperature which means that a part removed from the mould when hot will shrink more than a part removed when cold since some of the natural shrinkage can be counteracted by "freezing" the shape of the part in the mould. This means that thicker parts, which naturally contains more heat than thinner parts in the same product, will continue to shrink when cooling outside the mould. This will inevitably cause warping in the product. This problem has so far been prevented by designing the products with uniform material thickness.

There are however some cases where it would have been an advantage to be able to design products with different material thicknesses. One such example is containers where the walls and the bottom does not have to be particularly strong and the carrying structure of the container has to be strong since a lot of containers are to be stacked on top of each other, adding load to the container in the bottom of the stack. The thickness of the side walls and the bottom will in this case have to be over-dimensioned to be adapted to the injection moulding process since the carrying structure has to be sturdy. This will lead to a container heavier than necessary and that more material than necessary is used. This will of cause lead to an uneconomical product.

According to the present invention it is possible to manufacture a product where the above mentioned disadvantages are avoided. The invention relates to a flat or semi-flat element including a partly or completely circumambient frame. The element is manufactured through moulding of a polymeric material, preferably injection moulding of a thermoplastic material. The invention is characterised in that the element includes a carrying structure, constituted by the frame, and an

intermediate wall section. The wall section is connected to the frame via a resilient section which is a part of the wall section. The differences in the temperature related shrinkage between the frame and the wall section is hereby absorbed by the resilient section whereby warping of the element is avoided. The frame is preferably constituted by a U-shaped profile, a number of tightly placed ribs, a closed hollow profile or the like. The wall section is suitably connected to the frame at or at least near to to the gravity centre line of the frame.

According to one embodiment of the invention the frame is a closed hollow profile formed through injection of a pressurised fluid into a still molten thermoplastic material. The material thickness of the wall section is thinner closest to the connection between the frame and the wall section than the average thickness of the wall section and the frame, whereby a barrier is formed in this connection part at the solidification of the thermoplastic material. The barrier prevents the pressurised fluid from entering the wall section during the manufacturing process.

The hollow profiles can suitably be achieved by substantially filling the mould with molten thermoplastic material from an injection nozzle. The molten thermoplastic material is then allowed to solidify somewhat on the surface closest to the inner walls of the mould cavity. A pressurised fluid, preferably a gas, is thereafter injected through an intake suitably placed at one end of the profile. The gas is allowed to flow into the still molten plastic in the core of the profile wherein a cavity is formed in the profile. The surplus of still molten plastic is hereby ejected from of the mould cavity. An element of this type can suitably be made from a thermoplastic material selected from the group, polyethylene, polypropylene, polyamide, polystyrene, acryl-butadiene-styrene, polyalkylene-terephthalate or the like.

The material thickness of the wall section is suitably thinner closest to the connection between the frame and the wall section than the average thickness of the wall section and the frame, whereby a pivot line is formed. The pivot line will facilitate resilient action in the wall section.

The element suitably forms a side wall of a container or a collapsible container, a bottom section of a container or a collapsible container or a lid of a container or the like.

The invention is explained further together with enclosed drawings, showing different embodiments of the invention wherein,

-figure 1 shows, in perspective a first embodiment of an element 1 with a frame 2 and an intermediate wall section 3 .

-figure 2a - 2d show, in cross-section, parts of different embodiments of an element 1 with profiles constituting the frame 2 of the element 1.

Figure 1 shows, in perspective one embodiment of an element 1 with a frame 2 and an intermediate wall section 3. The element 1 includes a carrying structure constituted by the frame 2, and an intermediate wall section 3. The wall section 3 is connected to the frame 2 via a resilient section 4. The resilient section 4 is a part of the wall section 3. Differences in the temperature related shrinkage between the frame 2 and the wall section 3 is absorbed by the resilient section 4 whereby warping of the element 1 is avoided.

Figure 2a - 2d show, in cross-section, parts of different embodiments of an element 1 with profiles constituting a frame 2 of the element 1. The element 1 includes a carrying structure, constituted by the frame 2, and an intermediate wall section 3. The wall section 3 is connected to the frame 2 via a resilient section 4. The resilient section 4 is a part of the wall section 3. The frame 2 is constituted by a U-shaped profile (fig. 2b), a number of tightly placed ribs (fig. 2d), a closed hollow profile (fig. 2a) or an L-shaped profile (fig. 2c). The wall section 3 is connected to the frame 2 at or very close to the gravity centre line 5 of the frame 2. The frame 2 is constituted by a closed hollow profile (fig. 2a) formed through injection of a pressurised fluid into a still molten thermoplastic material. The material thickness of the wall section 3 is thinner closest to the connection between the frame 2 and the wall section 3 than the average thickness of the wall section 3 and the frame 2, whereby a barrier is formed, in this connection part at the solidification of the thermoplastic material, which barrier, prevents the pressurised fluid from entering the wall section 3 during the manufacturing process. This thinner part will also act as a pivot line (Fig. 2a - 2b). The pivot line will facilitate resilient action in the wall section 3.

The intermediate wall section 3 can also be provided with a number of holes. These holes can be of different shape and size, depending on the requirements. Such holes are normally used in transport containers when ventilation is required

The invention is not limited to the embodiments shown, since it can be varied in different ways within the scoop of the invention.